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EXPLORATORY STUDY INTO SUSTAINABILITY EXPERTISE IN THE IRISH ARCHITECTURE, ENGINEERING AND CONSTRUCTION (AEC) SECTOR.

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Keywords: Sustainability expertise, sustainable practice, Irish construction

ABSTRACT

The Architecture, Engineering and Construction (AEC) sector is a rich environment, involving the use of expertise at various levels with much intensity and in unique situations. In the attainment of sustainable construction, construction sustainability performance is indispensable. The participants implementing sustainable construction practices are key to a sustainable construction sector. This study seeks to understand the level of sustainability expertise in the Irish AEC sector which is part of an ongoing research at the Dublin Institute of Technology, within the School of Surveying and Construction Management. The early explorative phase of this research involves getting a depth of understanding as to the level of sustainability expertise in the Irish AEC sector. The study adopts a bibliometric review as its method to explore how the sector has begun to change its practice around addressing sustainability expertise and performance. The outcome of this review confirms that a number of gaps do exist in the Irish AEC sector with regard to sustainability expertise in skills shortage and the need for skills development.

INTRODUCTION

The issue of sustainability in the Architecture, Engineering and Construction (AEC) sector is of prime concern these days as clients are requesting for more sustainable projects. Since the introduction of the philosophy of sustainable development by the Bruntland report in 1987, many industrial sectors have since then been taking steps to achieving sustainable development. Sustainable construction is a way for the AEC sector to contribute to the effort to achieve sustainable development. Sustainable development as defined by the Bruntland report (1987) is a concept that meets the requirements of existing generations without compromising the ability of upcoming generations to meet their own requirements.

In achieving sustainable construction, the participants implementing sustainable construction practices play a great role. According to Addis et al. (2016), excellent performance is underpinned by expertise and is central to achieving sustainable construction. Expertise collectively refers to the individuals together with their attributes and skills (Addis et al., 2016; Brand and Karvonen, 2007). This paper is an attempt to assess sustainability expertise in the Irish AEC sector as it moves towards the attainment of a more sustainable construction sector.

IRISH AEC SECTOR

The AEC sector in Ireland has emerged from a deep recession and is currently at a transitional stage (see fig. 1). The industry entered a deep recession but has sustained continual growth since the year 2012. Following years of decline in output from the years 2008 to 2012, the Irish economy has shown continual growth since 2013 and continues to grow (SCSI, 2016). The sector accounted for 6.6% of Gross National Product (GNP) in the year 2013 and since then has shown progressive growth due to quality economic decisions since 2008, as can be seen in table 1. The sector is forecasted to reach a value of 20 billion euros, which will approximately account for 7.6% of GNP in this year 2018 (See table 1). These proportions however are still below the 10% to 12% ratio considered a sustainable level by European standards (Linesight, 2018).

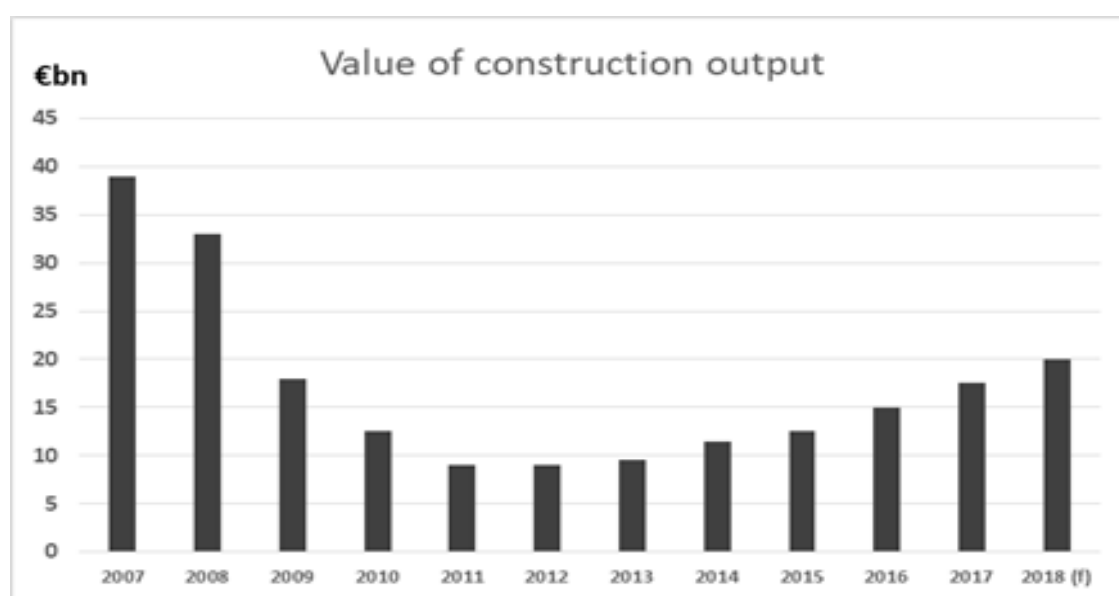


Figure 1. Value of Irish Construction Output 2007-2018

Source: Linesight, 2018

Table 1: Irish Construction Output 2012-2018

	2012	2013	2014	2015	2016	2017	2018 (f)
Value of output at current prices (€m)	9,395	9,723	11,147	12,650	14,935	17,500	20,100
Construction output as % of GNP	7.1%	6.6%	6.8%	6.2%	6.6%	7.0%	7.6%

Source: Linesight, 2018

Forecasted (f)

The renewed focus on recovery and growth of the Irish economy after quite a lengthy and deep recession is well appreciated (SCSI, 2016). Prospects for the construction sector appear brighter now than they have been in almost a decade as forecast by the sector and evidenced by the growth in construction production (Linesight, 2018). This nonetheless, the construction sector continues to face severe challenges and not the least of which is ensuring that it has the capacity to meet the recovery in demand which is expected to materialise over the coming years. A report by the Construction Industry Federation (CIF) (2016) of Ireland on 'construction skills and prospects' recognizes skills shortage as a significant challenge facing the Irish AEC sector. The severity of the construction recession has seen a major decline in the numbers working in the sector. If the required supply levels are to be delivered, the industry will need to ensure it has sufficient craftspersons and skilled workers. A skills shortage could threaten to derail the positive outlook for the AEC sector. An enhancement of the skills capacity in the industry is also required to ensure the industry can deliver the demands placed on it. According to a report (Building for Growth) from SCSI (2016), Ireland needs a construction sector which can support the ongoing recovery and growth of its economy. It further stated that a sustainable construction sector is a key element of any properly functioning economy. For Ireland to meet its output projections, the capacity of the construction sector will need to be boosted to be strong and more sustainable to help the economy as it grows into the future. Speedy measures should be implemented to ensure that the sector can meet the anticipated growth and reach sustainable levels for the benefit of the overall economy. This has inspired the study into sustainability expertise in the Irish AEC sector.

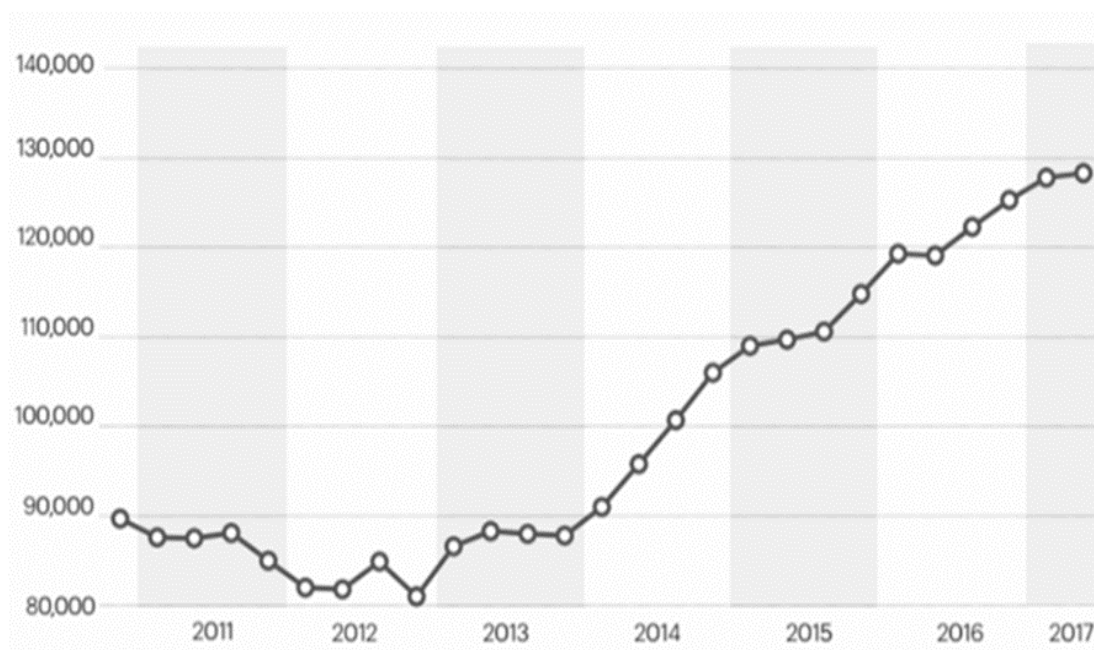


Figure 2. Employment in Irish Construction 2011-2017

Source: Linesight, 2018

SUSTAINABLE DEVELOPMENT AND SUSTAINABILITY EXPERTISE

Sustainability can generally be defined as the ability to be maintained over a long term (Anon., 2013). The concept of sustainability as defined by the Bruntland report (1987) is 'forms of progress that meet the needs of the present without compromising the ability of future generations to meet their needs'. It further defined sustainable development as 'development that meets the needs of the current generation without undermining the ability of future generations to meet their own needs.' The concept of sustainability is of prime concern in the AEC sector as the sector has been accused of causing problems ranging from excessive consumption of global resources to the pollution of its surrounding environment. Appropriate strategies, actions and practices are needed to help create a sustainable AEC sector (Scott and Bhattacharjee, 2017). The study of sustainability expertise in the Irish AEC sector is an attempt to help in this regard.

The ever evolving nature of technology coupled with the increasing reliance of society on technology create the need for expertise development and management. In this modern technological world of rapid change and unpredictable unknowns, sustainability and knowledge are key skills of the AEC sector in keeping pace (Scott and Bhattacharjee, 2017). Technology plays a dominant role in society and more sophisticated technologies require individuals or consumers who understand the underlying scientific and technical principles. Hence the need for expertise development and management to keep pace (Kanjanaabootra, 2017; Brand and Karvonen, 2007). This suggests that efforts to create a more sustainable development projects require participants or technical experts who understand the underlying principles of adopted technologies and practices.

Expertise as defined by Ericsson (2014) refers to 'knowledge and skills that collectively represent the mastery of a particular subject, achieved through instruction and experience'. Sage (2016) defined expertise in the field of construction as the acquisition of knowledge and skills related to a technical process, health and safety codes, organizational routines or even cultural norms. Addis et al. (2016) also explained expertise as individuals together with their skills and attributes. Expertise spans reason, intuition, knowledge, learning and action as well as being an individual and a collective attribute. For the purpose of this study, expertise is defined as individuals together with their act of acquiring knowledge and skills towards the mastery of a particular subject.

Expertise Development

The AEC sector is a rich environment, involving the use of expertise at various levels in much intense and unique situations. The problems with the sector do not hence lie with the practices themselves (Boyd and Addis, 2011). According to Newton (2016), the concept of expertise plays a central role in the field of construction, be it in professional practice, research or education. This is reinforced by Addis et al. (2016) stating that excellent performance is underpinned by expertise and is central to achieving sustainable construction. The development and management of sustainability expertise is indispensable in meeting the demands of sustainable development projects. This includes an assessment of technical experts and other practitioners such as engineers, architects, contractors and other

professionals who are involved in sustainable development projects. Sustainable development calls for people skilled at understanding and employing sustainability principles and thus, efforts to create more sustainable development require an examination of the opportunities and dangers of involving these technical experts (Brand and Karvonen, 2007).

The development of expertise usually starts in the form of some training which could be either formal or informal. Formal training could be in the form of a university or vocational institution and informal training could be in the form of apprenticeship (Kanjanaabootra, S., 2017). Dreyfus and Dreyfus (1986) proposed a model for expertise development which described it as a journey from a 'novice' to an 'expert'. The model described expertise as a function of experience and time where an individual enters a field as a novice and with experience and over a period of time becomes an advanced beginner, competent, proficient and ultimately an expert. Boyd and Addis (2011) endorse how relevant the Dreyfus model is in skills acquisition in construction. Their study confirmed that, rules may be needed when learning, but one must eventually set them aside if one is to become an expert. That is to become as expert, one has to switch from detached rules to a more involved and situation specific way of coping. The Dreyfus model has been summarized below:

1. **Novice:** adheres to rules strictly and without discretionary judgement.
2. **Advanced beginner:** has limited perception of situations though areas of knowledge and tasks have increased.
3. **Competent:** begins to cope with complex situation in a way such that actions involve long term goals.
4. **Proficient:** has holistic view of situations and can identify what is most important in a given situation.
5. **Expert:** has an intuitive appreciation of situations and with very little need for rules.

This study has been expounded by Kuhlmann and Ardichvili (2015) that professionals in a discipline will develop expertise through years of engaging in a high-value, non-routine work. The results of their study is shown in figure 3. The findings of Kuhlmann and Ardichvili (2015) study agree with Kanjanabootra and Corbitt (2016) in that knowledge and expertise accumulate through practice or experience. Kanjanabootra and Corbitt (2016) show in their study that learning and expertise development in construction professionals emerges incrementally and contextually from their peers and within cultural/social practices.

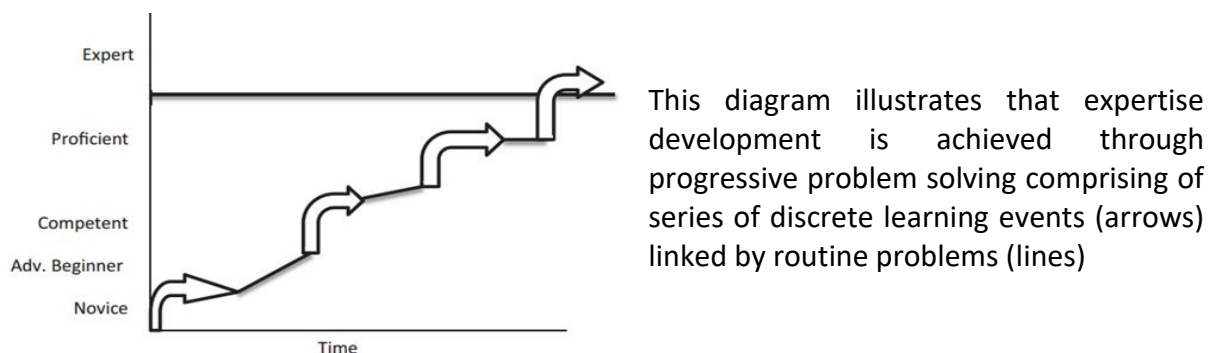


Figure 3. Expertise development levels
Source: (Kuhlmann and Ardichvili, 2015)

An understanding of expertise development is essential as this will enable organisations know what level their professionals are and can better develop their appropriate expertise (Scott and Kanjanabootra, 2018). Scott and Kanjanabootra (2018) further stated that mostly when construction professional are faced with difficult projects early in their career, they face series of steep learning curves and this challenges their competency as expertise development emerges incrementally and contextually. An understanding of this therefore will enable organisations provide the necessary training programs on which professionals can better develop their appropriate expertise.

RESEARCH METHOD

This research gains high motivation from the approach to study and gain a better understanding of the AEC sector expectations about essential sustainability knowledge and expertise in an ever changing and fast paced industry. The methodology applied was determined on the basis of relevance to the focus of this stage of the research enquiry but also on the basis of pragmatic positioning. This was the case as a different methodological stance would not have allowed the research to be completed within the constraints applicable. Creswell (2009) has stated that research methodology is the systemic approach that a research project adopts to accomplish the research's aim and with that in mind an explorative interpretivist position has been adopted. In relation to the purpose of the research: it is concluded that the theoretical argument developed for the enquiry has the potential, by using an explorative perspective, to reveal new insights and a better understanding of the awareness of sustainability and whether there is some alignment of those positions.

The overall research project will involve a mixed methodological approach, which for the purposes of this paper is beyond the scope of this paper as the early phase of the research has just been completed. What is present in the paper, is a justification of the approach taken for the bibliometric review. Traditional research design strategies usually rely on a literature review leading on to the formation of a hypothesis which can be put to test by experimentation in the real world. This is the goal of this stage of the research.

FINDINGS

This paper has shown the relevance of expertise in the AEC sector in fostering sustainable construction and more especially, in the Irish AEC sector. The paper is mainly a synthesis of available literature detailing the essence and need for an assessment of sustainability expertise in the Irish AEC sector. The findings from literature has been shown in table 2 below. The findings from the review clearly show that expertise development is vital to achieving a sustainable construction.

Table 2: Sustainability expertise indicators towards a sustainable construction (Ireland's AEC sector)

Issues/themes	Indicators	Source
Relevance of expertise in the AEC sector	The AEC sector is a rich environment, involving the use of expertise at various levels in much intense and unique situations. The problems with the sector do not hence lie with the practices themselves but very much with the people	(Newton, 2016; Boyd and Addis, 2011)
	'Excellent performance is underpinned by expertise so the latter has a central role in the undertaking and explanation of successful construction practice.'	(Addis et al., 2016)
	The ever evolving nature of technology coupled with the increasing reliance of society on technology create the need for expertise development and management. Sustainability and knowledge are key skills of the AEC sector in keeping pace	(Kanjanaabootra, 2017; Scott and Bhattacharjee, 2017; Brand and Karvonen, 2007).
Irish AEC sector and sustainability	The AEC sector in Ireland entered a deep recession but has sustained continual growth since the year 2012. Despite the continual growth percentages of 6.6% to 7.0% of GNP, these proportions are still below the 10% to 12% ratio considered a sustainable level by European standards.	(Linesight, 2018)
	The severity of the construction recession saw a major decline in the numbers working in the sector and since then, skills shortage is seen as a major challenge facing the Irish AEC sector. Skills shortage could threaten to derail the positive outlook for the Irish AEC sector. An enhancement of the skills capacity in the industry is also required to ensure the industry can deliver the demands placed on it.	Construction Industry Federation (CIF) (2016) of Ireland
	Ireland needs a more sustainable sector which can support the ongoing recovery and growth of its economy. Speedy measures should be implemented to boost the sector's capacity as it grows into the future and reach the 10% to 12% ratio considered a sustainable level by European standards.	Society of Chartered Surveyors Ireland (SCSI) (2016)
Expertise Development	The development and management of expertise such as engineers, architects, contractors and other professionals in the AEC sector is indispensable in meeting the demands of sustainable development projects. Sustainable construction calls for people skilled at understanding and employing sustainability principles	(Brand and Karvonen, 2007).

CONCLUSION

The early literature review illustrates the importance of questioning the definition of sustainability expertise discourse. Whether the problem is defined as one of bureaucracy or inadequate social mix, it is important to recognise that the decision to acknowledge that there exists a position that expertise in the AEC sector is a problem will be ideologically loaded. To

make the claim that sustainability expertise is lacking among AEC professionals as an important weakness is an outcome of the literature review. What discourse to use to delve further to unpack the different components of what is regarded as a distinct contribution to knowledge around sustainable expertise needs some direct consideration and will form the next phase of this research.

This study, so far, has confirmed gaps in the Irish AEC sector regarding sustainability expertise and the need for the sector's capacity to be boosted to be more sustainable. Skills shortage and development has been shown to be a major challenge facing Ireland's AEC sector. An empirical assessment of the level of sustainability expertise in the sector will therefore contribute greatly in helping in this regard which will be the follow on stage of this study. By clearly showing the state of the AEC sector in Ireland, this paper hence confirms the need for an empirical assessment of the sustainability expertise of the sector. This will as well boost the sector's capacity to increase its contribution to Gross National Product (GNP) to reach a sustainable level. European sustainability standards considers a sector's contribution to Gross National Product (GNP) as a sustainable level when it is above 10%.

This paper has shown that excellent performance is underpinned by expertise and how relevant the level of expertise development is in the AEC sector. An understanding of the levels of expertise development will enable organisations know what level their personnel are in their expertise can better develop their appropriate expertise. The follow on stage will be to collect empirical data from Ireland's AEC sector regarding the level of sustainability expertise and how this expertise is being used to advance the industry.

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